

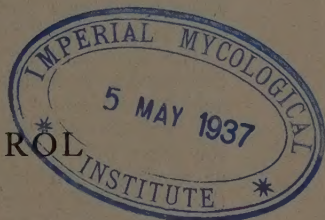
Georgia Experiment Station

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OAT SMUT CONTROL

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Comparative tests with a number of seed treatment materials and methods of treating seed oats have been conducted at the Georgia Experiment Station during the past five years. Several formaldehyde soak treatments have been included as a standard of comparison for other treatments, even though they have drawbacks and are now being superseded by better methods.

The solution for the first four treatments shown in the table was made by adding one pint of formaldehyde (37 to 40 per cent strength as carried in drugstores) to 40 gallons of water. The oats were thoroughly wetted with this solution, the treatments varying as to the length of time soaked or the time covered after removal from the solution. These four all gave good smut control and no injury to the stand. The seed was planted while still damp.

Treatments Nos. 5 to 8, inclusive, are a duplication of the first four except that the seed was spread out and dried several days before planting. This was to facilitate planting, since swollen, wet seed does not drill readily and must be sown broadcast, using a fourth more seed. Drying the seed, as shown in the table, injured the germination and reduced the stand of plants after every treatment. It is probable that drying the seed concentrated the formaldehyde gas under the hulls in close contact with the seeds causing injury to the embryo although according to No. 11, where water alone was used, some injury was due apparently to wetting and drying.

Treatment No. 9 in which the oats were planted within a few hours after a short soak in formaldehyde solution was found in actual use on one farm and therefore given a trial here. It has several important advantages over wet treatments, such as: (1) the oats do not have to be held over night after soaking, (2) no floor space is needed, (3) only such quantity of seed is treated at a time as can be planted in a half day and no wet seed is likely to

be on hand should a rainy spell occur, (4) the seed does not swell seriously. The seed is dipped long enough to be thoroughly wetted, then dumped into a wagon and taken at once to the field. There was practically no seed injury and the amount of smut was within the limits of satisfactory practical control. This method, however, is not considered equal to some of the dust treatments.

The formaldehyde spray treatment (No. 10) was made at the rate of one pint of formaldehyde to 40 bushels of oats, whereas most recommendations now are for one pint to 50 bushels. There was considerable stand reduction but good smut control.

The formaldehyde dust treatments, Nos. 12-16, bring out the fact that seed so treated must be covered at least one day but cannot be held bagged many days without some seed injury. This dust gives off formaldehyde gas which penetrates beneath the hulls and kills the smut infection when the treated oats are kept covered a day or so, but when confined too long in close contact with the seed the gas is likely to reduce germination.

Ceresan and Improved Ceresan (Nos. 17 and 18) both controlled smut satisfactorily and actually improved the stand. Of these two dusts the last named is the cheapest to use and the most satisfactory. The active ingredient in Ceresan is ethyl mercury chloride, while that in Improved Ceresan is ethyl mercury phosphate. DuBay dust, 1100 WW (No. 19 in table), contains the same amount of ethyl mercury phosphate as Improved Ceresan, that is 5 per cent. It was tested here one year before it was put on the market as Improved Ceresan. DuBay dusts 1134, 986, and 999 (Nos. 20-22 in table) contained smaller percentages of ethyl mercury phosphate than Improved Ceresan and were preliminary steps in the development of Improved Ceresan by the Bayer-Semesan Company. Both Sanoseed dusts (Nos. 23 and 24) failed to give satisfactory control of smut although the stand was improved.

RECOMMENDED TREATMENTS

Several seed treatments are described to permit some leeway in choosing one that happens to be the most convenient at the moment. It should be kept in mind that successful application of these treatments to oats depends upon the penetration of a toxic substance, liquid or gas, beneath the hulls and its retention for a long enough time to destroy the infection and yet not so long that germination of the seed is seriously reduced.

IMPROVED CERESAN. This material appears to have more advantages than others tried at this Station. At retail one-pound prices the cost of this material is a little less than $2\frac{1}{2}$ cents per bushel of oats treated. However, if purchased in larger quantities by county agents it should not cost more than $1\frac{3}{4}$ cents for each bushel of oats.

Treating is best done in some kind of mixing barrel. A good one may be made out of a steel oil drum or any tight barrel by running a pipe, as an axle, diagonally through opposite corners of the barrel. This axle is bolted or welded to the barrel so that both will turn together, and a crank is made at one end with short pieces of pipe and a couple of elbows. The whole is supported on two wooden horses, one at each end. A hinged door is made in one end

and the cracks about the door well padded with cloth or rubber from an old inner tube so that it may be tightly closed against the escape of dust. By running the axle diagonally through the barrel, the oats are not only rolled sideways as the barrel is turned but also tumble alternately from end to end.

One bushel of oats is treated at a time. Put one-half ounce of Improved Ceresan dust on the seed in the barrel, close the door tightly and turn at a moderate speed for about two minutes. When thoroughly dusted dump oats into clean bags and keep bagged one day before planting, or they may be piled on a clean floor and covered with bags. A still more simple way is to place the seed and dust in a barrel, close tightly, then roll the barrel about on the ground.

If a barrel duster is not available, the oats may be piled on the floor a few bushels at a time, adding one-half ounce of the dust on each bushel of oats as it is put on the pile. Shovel over three or four times, then bag or cover with sacks as piled up, and leave covered one day. If the treated oats are not held covered a sufficient time, smut may not be controlled. On the other hand, storage for several days or a week may cause some reduction of stand in the field.

FORMALDEHYDE DUST. Formaldehyde dust may be purchased ready to use and is applied in the same way as described for Improved Ceresan except that it is necessary to use three ounces to each bushel of oats. It is more expensive than Improved Ceresan. It loses its strength rapidly if not covered tightly and it is necessary to secure fresh material each year. It gave good control of smut but slightly reduced the stand in our trials.

FORMALDEHYDE SPRAY TREATMENT. Mix one pint of formaldehyde with one pint of water and pour into a small hand sprayer such as is used for spraying flies. Pile the oats on the floor and while one man shovels the oats to a new pile a second man sprays from one to three shots onto each shovelful of oats as they are moved. The number of shots depends on the amount of oats in the shovel and the size of the sprayer. Gauge the shots so that the quart of mixture will treat about 50 bushels of oats. Then spray some sacks and cover the oats not less than four hours. If the treating is done late in the day the oats may be covered overnight but not longer. Formaldehyde is somewhat erratic in its action, high temperatures speeding up its action. This is a good treatment and costs less than a cent a bushel for material but there is some risk of seed injury, especially if the oats are stored a while before planting.

FORMALDEHYDE SPRINKLE TREATMENT. Add one pint of formaldehyde to 40 gallons of water. Pile the oats on the floor and while shoveling to a new pile sprinkle, using a garden sprinkling pot, this amount of solution on 50 bushels of oats. Wet some sacks with the same solution, spread over the pile and leave covered from four hours to overnight. Plant at once. This treatment is recommended only when other methods are not feasible. Wet oats must usually be broadcast using one-fourth more seed; and if it is necessary to store for a few days, there is almost certain to be some seed injury.

PRECAUTIONS. Dusts used for treating seed grain are poisonous

and must not be inhaled. Treating should be done in the open or in a good draft. A wet sponge may be tied beneath the nose if considered necessary. Most treated seed is poisonous as food for man or animals but formaldehyde treated seed may be fed to stock if thoroughly aired and dried a week or more before feeding.

Do not treat oats when the temperature is below 60° F. since at low temperatures the action of the treating materials is slowed down and smut may not be controlled. Very hot days are also to be avoided.

The tests recorded here were made with oats in hulls only. We have no data on the treatment of hull-less varieties. However, others have recommended Improved Ceresan for these varieties.

Do not use a greater dosage than recommended. It is possible for a treatment to cause greater loss than would have been caused by the smut.

THE EFFECT OF VARIOUS SEED TREATMENTS ON THE STAND AND ON SMUT IN OATS

No.	TREATMENT	No. OF YEARS	STAND INCREASE OR REDUCTION per cent	SMUTTED PLANTS per cent	SMUTTED PLANTS IN CHECK per cent
1.	Formaldehyde 1 pt. to 40 gal., soak 30 min., covered 4 hrs., planted damp.....	1	+ 1.7	0.0	22.1
2.	Formaldehyde 1 pt. to 40 gal., soak 30 min., not covered, plant damp.....	1	+ 1.6	trace	22.1
3.	Formaldehyde 1 pt. to 40 gal., soak 5 min., covered 4 hrs., plant damp.....	1	+ 5.4	trace	22.1
4.	Formaldehyde 1 pt. to 40 gal., sprinkled 1 gal. per bu., covered 4 hrs., plant damp.....	1	+ 3.0	0.0	22.1
5.	Same as No. 1 but dried before planting.....	5	-10.7	0.0	14.3
6.	Same as No. 2 but dried before planting.....	1	- 3.5	0.0	22.1
7.	Same as No. 3 but dried before planting.....	5	- 5.7	0.0	14.3
8.	Same as No. 4 but dried before planting.....	5	- 3.8	trace	14.3
9.	Formaldehyde 1 pt. to 40 gal., soak 5 min., planted damp within 2 to 3 hrs.....	3	- 0.3	0.2	5.2
10.	Formaldehyde 1 pt. to 1 pt., sprayed 1 qt. solution to 40 bu., covered 4 hrs., aired.....	4	-10.8	0.2	11.8
11.	Water only, soak 30 min., covered 4 hrs., dried.....	4	- 4.0	10.6	11.8
12.	Paraformaldehyde-talc dust 6.9%, 2 oz. per bu., planted at once.....	1	+ 0.7	17.0	22.1
13.	Paraformaldehyde-talc dust 6%, 3 oz. per bu., covered 3½ mo.....	1	-35.4	trace	24.9
14.	Paraformaldehyde-talc dust 6%, 3 oz. per bu., covered 3 days.....	4	- 3.4	0.0	11.8
15.	Paraformaldehyde-talc dust 6%, 3 oz. per bu., covered 1 day.....	4	- 1.6	1.6	11.8
16.	Ansul formaldehyde dust 6%, 3 oz. per bu., covered 1 day.....	3	- 4.4	trace	5.2
17.	Ceresan 3 oz. per bu., covered 1 day.....	2	+ 2.1	0.5	23.5
18.	Improved Ceresan ½ oz. per bu., covered 1 day.....	3	+ 3.3	0.0	5.2
19.	DuBay 1100 WW dust, ½ oz. per bu., covered 2 days.....	1	- 4.4	0.0	24.9
20.	DuBay 1134 dust, 1 oz. per bu., covered 2 days.....	1	- 3.0	0.0	24.9
21.	DuBay 986 dust, 1 oz. per bu., covered 10 days.....	1	+ 9.5	4.3	22.1
22.	DuBay 999 dust, 1 oz. per bu., covered 10 days.....	1	+ 9.4	3.9	22.1
23.	Sanoseed dust, 3 oz. per bu., covered 14 days.....	1	+ 8.8	10.7	22.1
24.	New Sanoseed dust, 3 oz. per bu., covered 14 days.....	1	+ 6.5	9.3	22.1